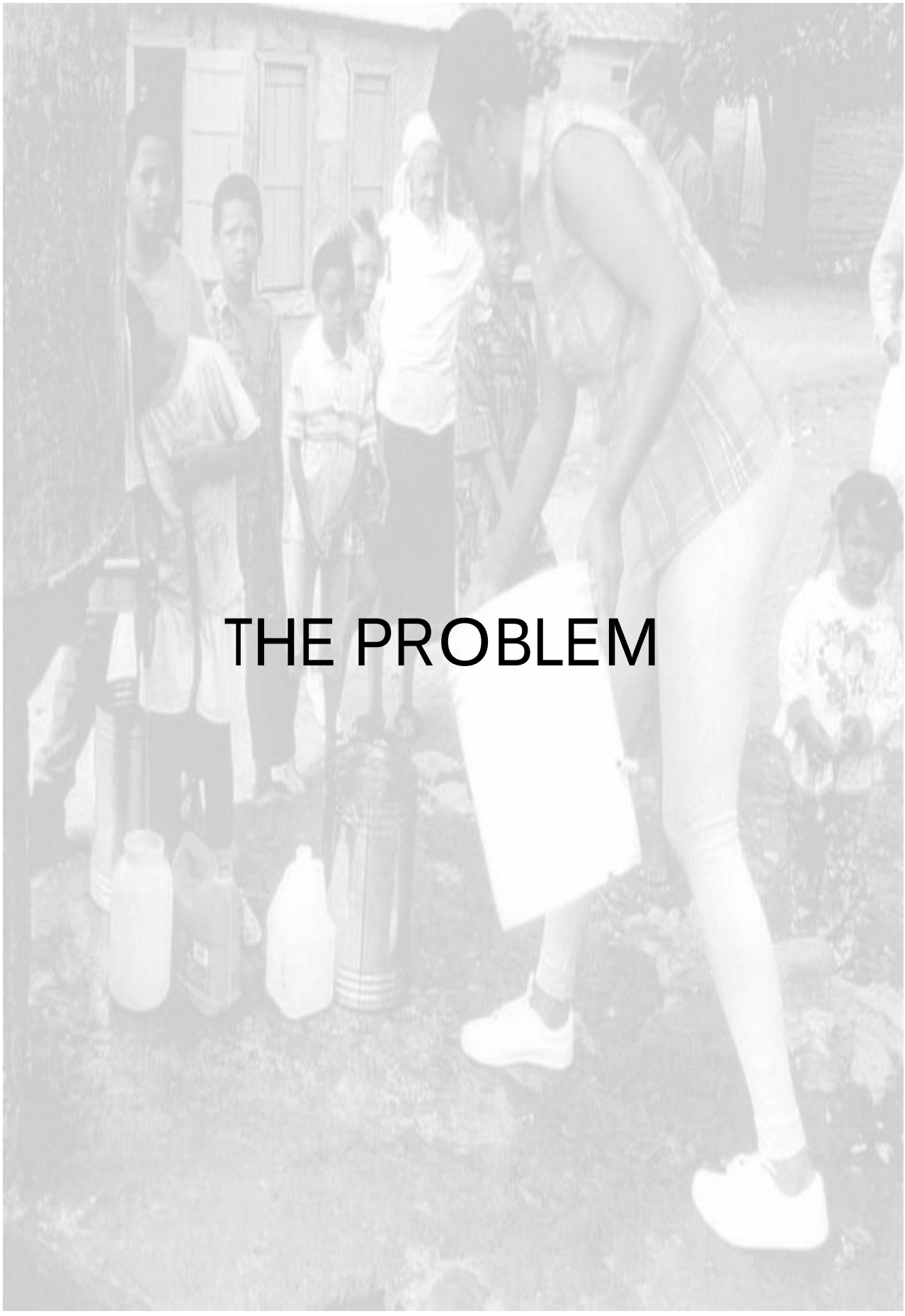
THE PATENTED EAGLE SPRING MISSION FILTER™

FORWARD

The MISSION FAMILY WATER SYSTEM was developed through a partnership of ministry, business, and science to answer the microbiological problems found in water that directly relate to the health and welfare of the population of many rural areas. It was found that most are too sophisticated, costly and difficult to implement into a rural setting that exists in most countries.

"All peoples, whatever their stage of development and their social and economic conditions, have the RIGHT to have access to drinking water in quantities and of a quality equal to their basic needs." - United Nations Water Conference of 1977 in Argentina.



THE PROBLEM

THE PROBLEM

Our earth is over 70% water. Of that 70%, only 3% is considered "fresh" water or water that is available for drinking. The key word is "available". Although the water is available it may not be suitable for drinking. The suitability of the available water for consumptions is affected by natural geological contamination, chemical contamination and human and/or animal waste contamination. This reduces the available "potable" drinking water worldwide to less than 1% of the total water available.

According to the World Health Organization (WHO):

- 80% of all diseases in Third World or developing countries were transmitted through polluted or contaminated water.
- 1.2 billion people cannot drink their water without risking disease or death.
- 50% of worldwide infant mortality or 4 million children every year die due to contaminated water or waterborne disease, that's 1 child every 8 seconds.

The United Nations named the 1980's the "International Water Decade" to try and focus attention on the ever-growing problem. Yet in spite of the expenditure of large amounts of resources, lack of access to potable water remains the most important Public Health problem on earth.

As part of this worldwide problem there is also a need to make more water available in close proximity to the user, which has produced an immense amount of activity on the part of different agencies to develop wells. The result is that there are now a growing number of water sources that have been developed and now found to be contaminated and unusable. Care International and U.N.I.C.E.F. have reported that almost 90% of the wells that they have developed to provide water have been contaminated and not usable for consumption.

According to Dr. Peter H. Gleick, President of the Pacific Institute, as many as 76 million people, mainly children, will die from preventable; water related diseases by 2020, even if current United Nations goals are reached. "Under the most optimistic scenario we examined, the death toll from water-related disease is still staggering", continued Dr. Gleick, "and would exceed the projected deaths from the global AIDS epidemic. This largely hidden tragedy ranks as one of the greatest development failures of the 20th century."

"Far too much money has been spent on centralized, large-scale water systems that cannot be built or maintained with local expertise or resources, while traditional and community-scale systems have been inadequately funded and supported," said Gleick. "It is time to change direction, toward a "soft path" that relies on smaller-scale systems designed, built, and operated by local groups".

Carlo Rietvield, past Director of Water Projects for the World Bank explains that large amounts of money and resources have been spent on "infrastructure" in many countries where this problem is the worst, only to discover later that the "hi-tech" solutions are not being maintained and in some cases has actually become the problem rather than the solution. The use of "simple, inexpensive systems that use appropriate technology remain the best way to attack this problem."

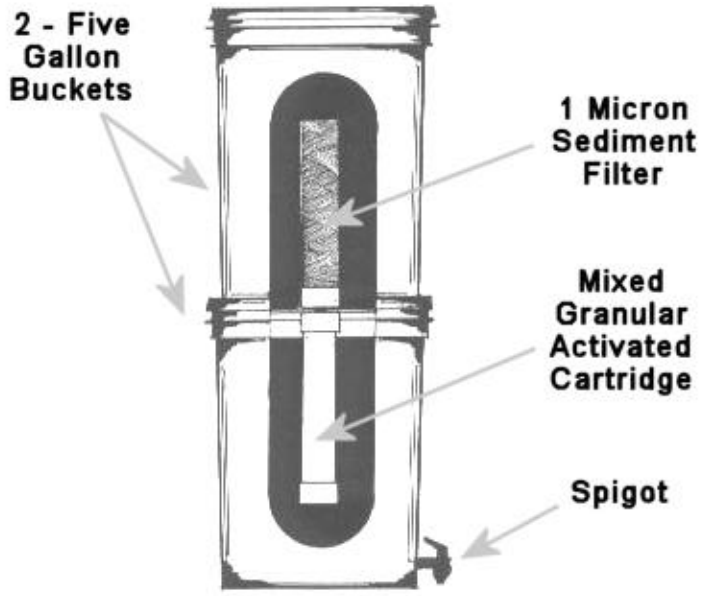
THE SOLUTION

THE SOLUTION

In 1996, Stephen Dann, President of Eagle Spring Filtration, in conjunction with Dr. Pedro Bernal, Department Head of Chemistry at Rollins College, and Sister Bernadette of the Diocese of Orlando worked to develop an inexpensive system that could be made available to those areas in need of clean drinking water. The system was to be simple, easy to assemble and operate, and affordable for either the family or an organization to purchase.

A three step water sanitation and filtration system was developed that could be assembled on site and operate for up to six months prior to any component replacements. The initial cost to the family or organization was under forty-five dollars, with replacement components at the end of six months costing less than twenty dollars.

Since that time over 20,000 units have been in place in the field in the Dominican Republic alone, where it was reported that as many as one in five children under six years old living in remote areas die due to waterborne disease. And over 30,000 units have been distributed through various organizations throughout the world such as Rotary International, Episcopal Church, Catholic Church, Red Cross (Dominican Republic), Operation Blessing and many more. Because this unit is a "family" unit, these 50,000 plus Mission Filters have impacted over a quarter of a million people.




TESTING

TESTING OVERVIEW

The longest history and largest application of this product to date, is in remote areas of the Dominican Republic. The Medical Mission of the Diocese of Orlando alone reports a 92% reduction in infant mortality due to the application of the Mission System and how that application affects the hygiene of the villagers.

In the summer of 2000, Dr. Pedro Bernal, Professor and Chairman of the Chemistry Department at Rollins College in conjunction with Dr. Quick and the Centers for Disease Control started a scientific study of the application and performance of this system on completely new villages in a very controlled setting. This field study was funded in part by Stephen Dann, the patent holder and president of Eagle Spring Filtration, along with Mr. Randolph Hearst, The Hearst Foundation, Associated Colleges of the South and Emery University.

The study was implemented at the village of El Venu in the Dominican Republic. Twenty-five units were placed with families where a controlled study could take place. All of the water sources were found to contain high levels (by WHO standards) of microbiological contamination (300 to 800 colonies). The units and families were monitored and by the end of the second round of testing, all systems were producing water that presented little or no risk to the consumer. Specifically 85% of all units produced in the "No Risk" category of zero colonies and the balance in the "Little Risk" category of one to ten colonies.

It is important to understand that the World Health Organization (WHO) recognizes that no fecal colonies is an unrealistic parameter for untreated sources. The truly important question is not how many colonies are acceptable, but how many colonies people can safely consume. It is a question that has been the subject of a number of studies. The following categories have emerged from the available evidence and are now accepted by the World Health Organization:

CATEGORIES	Fecal Coliforms/100 ml	Health Risk
A	0	No Risk
B	1-10	Little Risk
C	11-50	Intermediate Risk
D	>50	High Risk

These results show, that the Mission Filter can turn highly contaminated water, not fit for human consumption, into water that presents little or no risk to the user and effect major changes in mortality rates from microbiologically contaminated drinking water. Additionally, these results indicate that not only is the Mission Filter an effective system for a water problem in remote third world areas, but it confirms its use as an emergency water system as well. The current worldwide drinking water problem could be immediately impacted by a program and organization that would successfully introduce them.

SPECIFIC TESTING INFORMATION – BROWARD TESTING

Broward Testing Laboratory Testing
Broward Testing Laboratory, LTD.
Technical Report – Project #98/26 – September 03, 1998

Method:

1. The system was assembled according to the supplied instructions, and then given a cursory decontamination by wiping all internal surfaces with isopropyl alcohol.
2. To confirm general decontamination, 99 mL of a sterile buffer were introduced to the lower bucket. The bucket was rotated and tipped to allow the buffer to contact as much surface area as possible. A sample was then taken for Coliform analysis through the bottom spigot.
3. The top bucket was filled with tap water to condition the filters and rinse the carbon fines. A sample of the tap water was taken at this time and analyzed for free chlorine.
4. The holding bucket was filled with tap water and dechlorinated with a small spatula full of Sodium Thiosulfate. The solution was stirred and allowed to sit, then was analyzed for free chlorine. Free chlorine was not detected.
5. The dechlorinated tap water in the holding bucket was then inoculated with a laboratory strain of E. coli (IDDEXX Laboratories, Lot S1615). A sample was taken for analysis. The solution was stirred with a sterile pipette and allowed to sit for 30 minutes.
6. Five milliliters of household bleach (Clorox brand) was added to the bacteria spiked water and stirred with the sterile pipette. A sample was analyzed for free chlorine and was found to be above the analytical range of the analysis (0.1 to 3.0 PPM free chlorine). The approximate concentration of free chlorine was interpolated to be around 5 PPM. The contents of the bucket were allowed to sit for an additional 30 minutes.
7. During this time the water in the top bucket was "conditioning" the filters and filling the lower bucket. After about 2/3 of the water was transferred, the lower bucket was emptied. Carbon fines were noted in the filtrate. The last third was again allowed to flow into the lower bucket.
8. The remainder of the water from the top bucket (minus a holdup volume of approximately 2 liters) filtered into the lower bucket. No more fines were noted. This water was drained to waste through the spigot.
9. After 30 minutes of "sanitation" a sample was taken from the holding bucket for free chlorine analysis. The free chlorine was found to be 1.45 PPM.
10. The water from the holding bucket was poured into the top bucket and filtration started.
11. When about 2/3 of the lower bucket was filled. A final sample was taken for analysis.

Results:
Analysis for Free Chlorine was performed via method 2540C, Standard Methods 18th ed.
Analysis for Coliform Bacteria was performed via method 9222B, Standard Methods 18th ed.

SAMPLE POINT	**FREE CHLORINE (in PPM)**	**TOTAL COLIFORMS (in CFU per 100 ml)**
Background	N/A	BDL
Tap Water	0.2	BDL
Dechlorinated Tap Water	BDL	N/A
Challenge	N/A	4×10^4
Sanitation	>3.0	N/A
After 30 minutes	1.45	N/A
Filtrate	0.2	BDL
*PPM = Parts Per Million *CFU = Colony Forming Units *N/A = Not Analyzed *BDL = Below Detectable Levels (<0.1 PPM)		

Conclusion:
Eagle Spring's Mission Filter proved effective in sanitizing 5 gallons of dechlorinated tap water that had been inoculated with E. Coli to a level of 4 x 104 CFU per 100 ml. After chlorination with 5 ml of household bleach and contact time of 30 minutes, the product water had no detectable Coliform bacteria and a free chlorine level of 0.2 mg/L.

Field Performance Testing – Village of El Venu

Dr. Pedro Bernal – Department of Chemistry, Rollins College
Dr. Robert Quick – Centers for Disease Control
Associated Colleges of the South

Introduction:

This document reports the result of a rather comprehensive study of the field performance of 60 of the Mission Filters in the village of El Venu in the Dominican Republic, some of which have been in use for over 2 years. The investigation consisted of chemical and microbiological measurements of the water produced by the filters, and the water sources used by the villagers, as well as epidemiological studies of the health impact of the filters. Dr. Pedro Bernal, of the Chemistry Department at Rollins College, and his students, performed the chemical and microbiological measurements. The epidemiological surveys were conducted by graduate students in Public Health from Emory University under the supervision of Dr. Robert Quick of the Centers for Diseases Control (CDC).

Water Sources and Filters:

The primary sources of water for the community of El Venu consist of two rivers and rainwater. Both the river water and rainwater is frequently stored in or around the household in large steel drums (sometimes cement-lined), large plastic containers, buckets, or wide-neck ceramic containers known as "tinajas".

Sources:

The two local rivers are highly contaminated. As indicated the levels of fecal contamination of the rivers can rise as high as 3500 cfu/100mL. This level of fecal contamination places anyone who would drink this water without some form of disinfection at "high risk" of diarrheal illness. The stored rainwater typically has lower levels of fecal contamination (0 – 1000+ cfu/100mL), yet almost half (44%) of the water presented an "intermediate" or higher risk.

Results:

A total of 75 analyses were made of 60 filters, with 12 filters having been visited more than once. As shown by the table below, approximately 90% of the filters were shown to produce water that presents "Little" or "No Risk". Given that some users refuse to chlorinate, this is a very good result.

RISK	**CFU/100 mL**	**# of Filters**	**Percentage**
No Risk	0	43	58%
Little	1-10	21	28%
Intermediate	11-50	7	9%
High	>50	4	5%

Chemical Results:

The filters are also performing well chemically. As shown below, all of the tests (100%) indicated that the filters were producing water of acceptable turbidity and more than three quarters (84%) of acceptable pH. The residual chlorine content presents a problem since at least three quarters (76%) of the tests indicate that the water in the filters is below the recommended range of 0.2 – 0.5 ppm. This is, in the main, a result of the fact that the carbon cartridge of the filter is very efficient at chlorine removal.

	Under Acceptable Range	**Within Acceptable Range**	**Over Acceptable Range**
Turbidity < 5 NTU	-----	100%	0%
Residual Chlorine 0.2 – 0.5	76%	15%	9%
pH 6.5 – 8.5	0%	84%	16%

Conclusion:

These results show that the Mission Filter, when properly used, can turn highly contaminated water, not fit for human consumption, into water that presents little or no risk to consumers.

INSTRUCTIONS

EAGLE SPRING FILTRATION – MISSION FILTER
ASSEMBLY INSTRUCTIONS

List of Materials:
2 – Five gallon buckets with sealable lids
1 – 2 inch receiver cup for the top sediment filter
1 – ¼ inch white nylon hex nipples (threaded)
2 – 3/8 inch black rubber washers
1 – 10 inch string wound 1-micron sediment filter
1 – ¾ inch plastic red plug
1 – 10 inch PVC carbon filter

1. Through the pre-drilled hole in the bottom of the top bucket, insert the ¼ inch nylon nipple.

2. Taking the lid of the bottom bucket, place it over the remaining exposed end of the nylon nipple currently installed in the bottom of the top bucket seating the lid securely to the bottom of the top bucket.

3. On each exposed end of the nylon nipple, place a rubber washer, one on the exposed end of the nylon nipple in the bottom of the top bucket, and one on the exposed end of the nylon nipple in the lid of the bottom bucket.

4. With nipple and washers in place, thread the 2-inch receiver cup onto the end of the nipple that is extended into the bottom of the top bucket.

5. Thread the 10-inch carbon filter onto the other end of the nipple that extends through the lid of the bottom bucket.

6. Hand tighten the cup and filter until the two black washers are squeezed between the cup and the bucket, and the filter and the lid so that no water can leak through the hole.

7. Take the ¾ inch plastic red plug and make a small “X” cut in the center of it and place it in one end of the core of the 1 micron string wound cartridge.

8. Insert the 1-micron string wound cartridge into the receiver cup in the bottom of the top bucket making sure that the end with the plastic red plug is at the top and the open end is in the receiver cup. See Operating Instructions for instructions on using the wood dowel.

9. Take the now assembled filters, top bucket, and bottom lid and place on top of the bottom bucket so as to form a sealed unit.

The system is now ready for operational instructions.

EAGLE SPRING - MISSION FILTER
OPERATING INSTRUCTIONS

Important Notes:

1. See PRE FILTRATION CHLORINE DEMAND TEST TO TEST CHLORINE LEVEL PRIOR TO USE OF UNIT

2. Your system will function better and last loner if you filter any large visible sediment and trash that may be present in the water by pouring the water through a clean cloth placed over the opening of the top bucket.

3. Standard household bleach (5.5% solution) is the normal sanitizing agent used for this system. However, chlorine pills, powder or other liquid chlorine can be used as long as the correct percentage is computed, the chlorine contains no other chemical agents that might be harmful, and the chlorine agent used, if in solid form, dissolves in a timely fashion. Call 1-800-881-7620 for questions concerning the use of other chemicals.

4. Care should also be taken to wipe out the bottom bucket and spout with a clean cloth wet with chlorine after each use in order to maintain the sanitized state of this part of the system and to keep the lids sealed on both buckets while in use.

OPERATION:

1. Insert the wood dowel into the red plug in the top of the 1 micron string wound cartridge and push it down into the nylon fitting between the buckets to seal off water flow. It may be necessary to remove the red plug, insert the dowel, push the dowel into the hole and then push the red plug back in.

2. Pour the water to be treated into the top bucket. NOTE: IF THE DOWEL IS IN PLACE, NO WATER SHOULD BE HEARD TRICKLING INTO THE BOTTOM BUCKET. Add 1 teaspoon (25 drops) of household bleach (5.5% chlorine) per 5 gallons of water.

3. Allow chlorinated water to set for 30 to 40 minutes. Care should be taken to keep this water away from any other type of contamination, animals, etc.

4. Gently pull the wood dowel out of the fitting about 1 inch and allow the gravity filtration process to take place. This is normally a 30 to 60 minute process. Be careful to twist slightly on the dowel as you pull upward so as not to pull out the red plug in the top of the string wound cartridge.

5. Potable water can be dispensed from the spout in the bottom bucket.

PRE-FILTRATION CHLORINE DEMAND FIELD TEST

Prior to the use of the Mission Filter system, it is imperative to determine the amount of chlorine that it will require for any particular water supply to destroy all of the oxidizable impurities (such as microbiological contaminates, hardness, minerals, etc). This will ensure complete bacteria kill, as well as optimize the performance of the Mission Filter.

Chlorine demand is the amount of chlorine that is used up in the process of disinfection. It is important to note that all water supplies have a different chlorine demand. Chlorine residual is the amount of chlorine that is left over after a minimum of thirty minutes of holding or contact time. When the chlorine dosage is larger than the chlorine demand, it will leave a residual in the treated water.

PROCEDURE:

1. Take a five-gallon bucket and fill it to two or three inches from the top with raw water.

2. Add a chlorine dosage of five cubic centimeters (5 cc's, which is equivalent to 1 teaspoon) of household bleach (5.5% chlorine). Mix the solution with a long spoon or other mixing device for approximately 1 minute.

3. Cover the mixed solution, and let stand for a minimum of thirty minutes.

4. Check the chlorine level of the mixed solution after the holding period. If the residual chlorine is .5 to 1.5 parts per million (ppm), called the target residual, you can now proceed with the enclosed directions. If the target residual is less than .5 ppm, or if there is no residual chlorine, add one half of a teaspoon more of chlorine (5.5% chlorine) and retest. This procedure should be repeated until the target residual (.5 to 1.5 ppm) is reached.

5. The first 2.3 gallons through the system should be discarded due to the harmless carbon fines that will be flushed from the filter system.

NOTE: Failure to perform the above procedure could result in incomplete microbiological destruction, and thus render the system ineffective, and leave the water with possible remaining contamination.

TESTIMONIALS AND THOSE INVOLVED

PERFORMANCE TESTIMONIALS

"It is evident that the Eagle Spring Mission Filter is an effective means to provide safer drinking water where central treatment is not available. It is portable, economical, and easy to understand and operate, and can mean the difference between family health and the continued risk of exposure to potentially life-threatening illnesses." – Ed Giordano

Ed Giordano is a technical consultant with 20 years of fluid filtration industry experience. A design engineer by training, he holds 18 U.S. patents in a range of fluid filtration technologies. He is also currently President of The Foundry, Inc., a manufacturer and supplier of component parts to the potable water filter industry.

"The Mission Filter, when properly used, can turn highly contaminated water, not fit for human consumption, into water that presents little or no risk to the consumer and effect major changes in mortality rates from microbiologically contaminated drinking water. Additionally, these results indicated that not only is the Mission Filter an effective system for water problems in remote third world areas but it confirms its use as an emergency water system as well. The current worldwide drinking water problem could be immediately impacted by a program and organization that would successfully introduce them." – Dr. Pedro Bernal

Dr. Pedro Bernal is Professor and Chairman of the Chemistry Department at Rollins College.

"In an area where 1 in 5 children die due to waterborne disease, the Mission Filter has provided a 92% reduction in the infant mortality rate." – Sister Bernadette McKay – Medical Mission of the Diocese of Orlando

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"Our people in India fell in love with the filter and exclaimed that this could be the answer for the people in the slums and are pleased with it's low cost." – Peter Dance – Operation Mobilization

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"Finally the promise of an inexpensive, portable, practically maintenance free solution to the global water crisis." – Bishop Stephen Jecko, Episcopal

THOSE INVOLVED

	Stephen Dann President Eagle Spring Filtration, Inc.
	Dr. Pedro Bernal Chemistry Department Rollins College
	Dr. Robert Quick Centers for Disease Control (CDC) Food borne & Diarrheal Diseases Branch
	Sister Bernadette Medical Mission for the Diocese of Orlando Dominican Republic
	Laveta Stewart Graduate Student of Public Health Saint Louis University
	Elizabeth Thiele Graduate Student Rollins College
	Rachel Woodruff Masters thesis on the project Now at the CDC Immunization program under Dr. Quick
	Zandra Dupree Masters in Public Health Now at the CDC Food borne and Diarrheal Diseases Branch under Dr. Quick
	Associated Colleges of the South
	Operation Blessing International
	Mr. Randolph Hearst and The Hearst Foundation
	Port Orange Ministerial Association
	West Jacksonville Rotary
	Institute of Latin American Concern (ILAC)
	Unidad Ecologica del Ejercito Nacional de la Republica Dominicana